

CASES OF POLIOMYELITIS ANTERIOR IN WHICH THE ABDOMINAL MUSCLES WERE AFFECTED.*

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HAVING had within a year two cases of infantile spinal paralysis (poliomyelitis anterior) in which the abdominal muscles of one side were involved, a condition I had not observed before, I determined to report them, together with a review of the similar cases to be found on record in the literature of the disease, in its infantile and adult forms, at my command. While in the great majority of cases of this disease the paralysis is limited to one or more of the extremities, still, cases have been observed, either in the infant or adult, in which were affected the facial, ocular, and laryngeal muscles, the muscles of deglutition, and those of the neck, the thoracic muscles of respiration, and those of the back, as well as the voluntary muscles of the rectum and the bladder; some of them very rarely, but others quite frequently. Involvement of the abdominal muscles, however, is one of the rarest events of this disease.

In reviewing the literature of this subject, out of 125 references to articles by 120 authors which I have collected, I was able to consult 100, which contain reports of over 600

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cases of infantile, and over 50 of the adult form. Out of this number I found but 2 cases in which involvement of the abdominal muscles was reported in the former, and not more than 7 in the latter group. In addition to this an analysis of 50 cases of the infantile form, from the record of the Department for Nervous Diseases at Manhattan Eye and Ear Hospital, a portion of them having been under my own care, the majority, however, under Dr. E. C. Seguin's, include the two cases of my own which I now report. Over 50 cases of the infantile form, recorded at Dr. E. C. Seguin's clinic for nervous diseases at the College of Physicians and Surgeons, fail to exhibit any additional cases of this character. Dr. Gibney informs me that he has never seen such a case at the Hospital for the Relief of the Ruptured and Crippled, although they have had over one thousand cases of paralysis in children, the majority belonging to the variety in question. My friend, Dr. E. C. Seguin, had observed but one such case in the infant, which is one of two cases on record. It is to be found in Dr. Newton M. Shaffer's monograph on Pott's disease. Dr. Shaffer has seen but one other case, to which he has kindly permitted me to refer, although many hundred cases of infantile spinal paralysis have been under his observation at the New York Orthopædic Hospital. Out of this large number of cases of infantile myelitis of the anterior horns (from 1,500 to 2,000 cases) I have found but five cases in which the abdominal muscles were affected, making it an extremely rare condition. It may be borne in mind, however, that in many it may have been overlooked, or, if observed, perhaps not recorded.

It is frequent to find reference to cases in which, during the first days of the disease, the child appeared to have lost *all* voluntary power, but this condition soon passes off, and it is indeed difficult to say whether it be due to a true

paralysis or to general asthenia. It is rare to find any reference to the abdominal muscles even in general works on the subject. Heine speaks of general distention of the abdomen due to spinal deformity, but not of paralysis of the abdominal muscles. Leyden is one of the few who mentions the subject. He states that "the muscles of the trunk, notably those of the back, and also those of the abdomen, may be involved;" he cites no cases however.

CASE 1.—Duchenne (fils). *Atrophic paralysis of the trunk; right, and of both inferior extremities.*

In the beginning of 1862, M. Bouvier reported to M. le Dr. Duchenne (de Boulogne) an infant of ten months, who, at four months, was attacked with generalized atrophic paralysis after a fever of 48 hours' duration. Movements were preserved in the superior extremities only. In the lower extremities the majority of the muscles gave no sign of existence, neither by electrical exploration nor by voluntary efforts. On the right side a great many of the muscles of the trunk and of the abdomen were atrophied. This produced a considerable lateral inclination of the spine with a right dorsal convexity; the abdominal walls being thinned on this side electrical excitation failed to produce muscular contraction, and the abdominal viscera presented the appearance of a hernia, the abdomen being depressed on the left side only, during the cries of the infant, while on the right, the intestines presented in relief, the hernia being considerably augmented. The child was not seen again. (Translated from *Arch. general*, vol., 2, p. 45, 1864.)

CASE 2.—I am indebted to Drs. Seguin and Schaffer for this case. I quote from Dr. Schaffer's monograph on Pott's disease: "The patient was six years old, and was placed under my care by Drs. W. H. Draper and E. C. Seguin. The original lesion was a poliomyelitis. Dr. Seguin furnished me with a memorandum of the muscles primarily affected. Those partially paralyzed (which recovered wholly under Dr. Seguin's treatment) were the muscles of the neck, arm, and thigh (left side). Those wholly paralyzed, and which did not recover, were the left serratus magnus, the left transversalis, and obliquus externus and the supra- and infra-spinati of the same side. The vertebral column presented an inflexible dorsal curvature toward the paralyzed side with the usual

compensatory (?) curve in the lumbar region. The patient walks well and has no loss of power in the superior members. There was marked contraction of the unparalyzed antagonists of the opposite (right) side."

CASE 3.—Referred to by Dr. Schaffer's permission, being a case he has already presented at a clinical lecture. E. H. G., a female, was affected with paralysis of the lower extremities, and of the back and abdomen of one side. (Photographs showing the extent of the atrophy were exhibited.)

Now follow my own cases :

CASE 4.—Male, æt. 3. In July, 1879, at the age of 20 months, had a severe attack of measles. A month later his mother observed, one morning, after he had passed a restless night, that he could not walk ; she took him in her arms, when he became unconscious, in which state he remained from 9 A.M. until 5 P.M. The following day (Sunday) he had slight epileptiform attacks, the eyes turning to one side, the hands being firmly clinched. On Monday he was still unable to walk, nor could he talk, although before the attack he could say "papa," "mamma," and a few other words. His mother noticed that the abdomen was distended, and after a few days that the left side was more distended than the right, and that both legs were paralyzed, the right being more completely so than the left. He could not sit upright. The arms were not affected, nor the muscles of the head, neck, or thorax. There was no bladder trouble, but constipation was marked for several days ; speech did not return, though he appeared as intelligent as ever. There was no affection of sensation, either general or special. The lower extremities began to show signs of wasting very early. On Aug. 30, 1879, he was referred to me for electrical treatment, at Manhattan Hospital, from Dr. E. C. Seguin's clinic at the College of Physicians and Surgeons. He was unable to sit or walk. There was absence of voluntary movements in both lower extremities ; the tissues were cold and flabby, the right more than the left ; the reflexes were absent ; sensibility preserved. The abdomen was distended to a marked degree on the left side, a decided bulging appearing over the muscular portion of the transversalis as large as one's fist. The muscles of the back on the corresponding side appeared softer and weaker than on the opposite side. The remaining muscles of the body were unaffected. The electrical examination revealed the presence of

the "degeneration reaction" in the lower extremities; namely, absence of farado-muscular contractility on muscle and nerve, absence of galvano-muscular contractility on the nerve, but exaltation of the same on the muscles, with qualitative changes consisting of a reversal of the formula of contraction, the anodal closing contraction being greater than the kathodal closing contraction ($An. C.C. > Ka. C.C.$), the contractions being slower than in a healthy muscle. This difference was most marked on the right side, and particularly in the anterior tibial group of muscles. The reactions of the individual muscles, and the variations from time to time as they appear on the records, are omitted.

It is next to an impossibility to test accurately, with electricity, the abdominal muscles of a crying child. I never succeeded in making a satisfactory examination of them in this case. There was no reaction to the faradic current on the affected side in the transversalis and oblique muscles; it was present, but diminished in the rectus; with galvanism, however, the results were too uncertain to determine whether the degeneration reaction was present or not. After a few days the abdomen, which was distended by gaseous accumulations, diminished in size; and when the child was lying upon his back nothing abnormal was observed; but during the execution of other movements, which required the use of the abdominal muscles, the whole left side of the abdomen became more prominent, and even the rectus failed to contract as powerfully as on the healthy side. He was treated by an ascending spinal galvanic current—the "movable stabile" method of Erb—and by local applications of the interrupted galvanic current, sufficiently strong to produce contractions. In consequence of the paretic muscles of the abdomen being put upon the stretch by the accumulation of gases, and by violent respiratory movements, the protrusion became more and more marked as the muscular atrophic changes continued. It became necessary, therefore, to devise some support to prevent this. A corslet or band, knit of cotton, and which would yield to a slight degree only, was made by the mother, and answered an excellent purpose, as it allowed a certain freedom of movement to the muscles, but not sufficient to produce stretching to an unnatural degree. This, I believe, to be an important point, too frequently forgotten in the treatment by supporting apparatus of deformities from paralysis. Absolute rest from the immobilization of a part can only tend to hasten atrophic changes, while movements within certain limits, besides inducing improvement in the general nutrition of the part, permits that ex-

ercise of functions so necessary to the continued repair and growth of muscular tissue in the muscles antagonistic to those paralyzed, and also in those muscular fibres which have not lost their function entirely through degeneration changes in the fibres themselves or from interruption of their neural connections. I objected, therefore, to the use of plaster of Paris and other unyielding corslets which had been recommended, and continued to use the knit band with satisfactory results. The condition, which was growing worse before treatment, improved quite rapidly under the use of the bandage and galvanism.

Oct. 7th.—There is reaction to the faradic current in the muscles of the left inferior extremity, even in the anterior tibial group, but none on the right side. There is considerable voluntary power on the left but none on the right side.

Oct. 15th.—Is able to sit up alone.

Nov. 12th.—He walks for the first time. Some voluntary movement has returned in all the muscles, except the right anterior tibial group.

On two occasions treatment was discontinued for a week or two, and each time he became worse; he recovered, however, when treatment was resumed.

Jan. 8, 1881.—Slight voluntary movements are to be seen in the toes of the right foot.

In his present condition the left lower extremity appears well developed and of normal temperature and color; there is a slight tendency to talipes (valgus), which is being antagonized by an elastic support from the inner side of the foot to the knee. The circumference of the right leg is 20 cm., of the left leg, 22 cm., of the right thigh, 29 cm., of the left thigh, 29 cm. The right extremity is cold and somewhat flabby. The muscles of the anterior group are the only ones which do not exhibit more or less voluntary power. Tendon reflexes absent. The paretic abdominal muscles have become stronger, but the bulging over the transversalis muscle is still present when he cries, though very much diminished from its previous condition. The muscles of the back in the lumbar region are not as firm as upon the healthy side. There is a slight tendency to lordosis, and a slight rotation; no scoliosis. The hemi-circumference around the abdomen on the paretic side measures 3 c.m. more than on the normal side. The electrical examination reveals upon the left side, to faradism, moderate reaction in all muscles; to galvanism, Ka. C. C. slightly > An. C. C. in muscles of the thigh. In muscles of the leg,

Ka. C. C. = An. C. C. Upon the right side, to faradism, no reaction except with a powerful current on the thigh muscles; to galvanism, Ka. C. C. = An. C. C. In anterior and posterior tibial groups An. C. C. > Ka. C. C. In abdominal muscles of paretic (left) side, to faradism, diminished reaction in rectus, still greater diminution in oblique muscles, and in transversalis probably absent; to galvanism, Ka. C. C. > An. C. C. in rectus, in other muscles, doubtful respecting the formula of contraction.

CASE 5.—Male, æt. 4. July 7, 1880, he fell from a third-story window (54 feet), striking on a two-wheeled hand-cart, which tipped, lessening the force of the fall, and throwing him to the ground. He was not unconscious, but called at once "Mama." Bruises were found on the legs only; no fractures or dislocations. He was feverish and too weak to walk, but was bright and talkative. In a week he could sit up. At the beginning of the third week after the accident he had a fever and was restless at night; the next morning the fever had disappeared, but he could not sit up, and was unable to move the right leg. He was referred to me by Dr. Richard Wiener, Aug. 6th. Examination revealed an absence of voluntary power in the right lower extremity in both thigh and leg muscles; no abnormality of sensation; absence of the tendon reflex. The left leg was normal, and at this time no involvement of other muscles was observed. There was no bladder trouble. Electrical examination showed the "degeneration reaction" in all muscles of the right thigh and leg. Normal reaction to faradism and galvanism in opposite side and in the upper extremities. After two weeks' treatment, as in the preceding case, he was able to sit alone; about this time distension of the left side of the abdomen was first observed, which increased until it was almost the counterpart of the first case. The muscles of the back in the lumbar regions were not as strong as on the opposite side. The same form of support and treatment was ordered, and after two or three weeks improvement began. A few fasciculi of the right internal oblique just above Poupart's ligament became weak, giving rise to a slight protrusion. The electrical reactions in the abdominal muscles were as follows: to faradism, diminished in the left rectus as compared with the right; slight reaction in oblique muscles, but none in transversalis. To galvanism, left side, in rectus, Ka. C. C. > An. C. C. — 24 cells; in oblique and transversalis, An. C. C. > or = Ka. C. C. Right side, normal reaction. Very little improvement has taken place in the paralyzed extremity.

Jan. 15, 1881.—He commenced to move the toes, but voluntary power has not returned in the other muscles. The nutrition of the feet has improved. The measurements are: Right calf, 18 cm.; left, 20 cm.; right thigh, 21 cm.; left, 27 cm. An obliquity of the pelvis and a slight compensatory scoliosis is observed when standing, but in the prone position the spinal column presents no lateral curvature. At times there is slight rotation. Voluntary power has returned in the oblique muscles and rectus to a considerable degree.

The fact that in both these cases the abdominal protrusion was at first scarcely noticeable, but gradually increased, is probably due to the fact that when degeneration took place in the muscles, the remaining tissues, deprived of this important means of support, became stretched by the abdominal viscera in violent respiratory movements. There is reason to hope, after the improvement which has taken place and is still going on, that great deformity, consequent upon the inequality of muscular power on the two sides of the spinal column, will be avoided. In the second case the condition of the right lower extremity rendered the prognosis far from hopeful.

Of cases of poliomyelitis anterior adultorum in which the abdominal muscles were affected, I found several cases reported, to which I shall refer very briefly.

Cumming reports a case (*Dublin Quart. Four.*, 1869, vol. i, p. 471) in which he states that all voluntary motion was absent below the neck, except slight movement of the right shoulder; this was during the first days of the disease; no direct mention of the abdominal muscles is made; it is, therefore, uncertain whether this case should be included or not.

Goldammer reports a case in a male, æt. 32 (*Berlin Klin. Wochen.*, No. 25, 1866), in which the muscles of the extremities, back, and abdomen, were paretic, but it is doubtful whether atrophy followed and the electro-muscular contrac-

tility was preserved, making the diagnosis of the case doubtful.

Lanceraux made an autopsy upon a young man who was first affected with poliomyelitis at the age of 16. No reference is made to the presence of paralysis of the abdominal muscles in the history, but atrophic changes were found in the abdominal muscles of the right side as well as in those of the left superior and right inferior extremities. This case is cited by Petit, fils (1873).

In one of Charcot's cases (No. 10 of Seguin's collection, in his "Myelitis of the Ant. Horns") there remained atrophy of the left nates, leg, and foot, of the anterior part of the right thigh, and of the left lower abdominal muscles, in which electro-muscular contractility was lost.

Dr. F. T. Miles reported a case of acute spinal paralysis before the American Neurological Society in 1875, in which the abdominal muscles were involved.

Dr. Bull reports (*London Lancet*, 1880, vol. 1, p. 563) a case of acute spinal paralysis in an adult in which, at first, there was complete loss of voluntary motion in upper and lower limbs, back, neck, and abdomen.

Kahler and Pick report (*Vierteljahrs & pract. H. K.*, Prag, 1879,) a case of subacute poliomyelitis in an adult in which the "degeneration reaction" was present in the abdominal muscles of one side.

These are the only cases which I have been able to find, and some of them are doubtful.

Adamkiewicz reported two cases in the *Charite Annalen*, Berlin, 1879—one of poliomyelitis and one of lead paralysis. In the latter the abdominal muscles were involved and furnished the "degeneration reaction," while in the former this was not the case. He makes a plea for the identity of the two affections from a pathologico-anatomical standpoint, a view maintained, and with good reason, by many eminent authorities.